

Supergravity

in Phenomenology and Cosmology

Supergravity

in Phenomenology and Cosmology

CMSSM - supergravity inspired

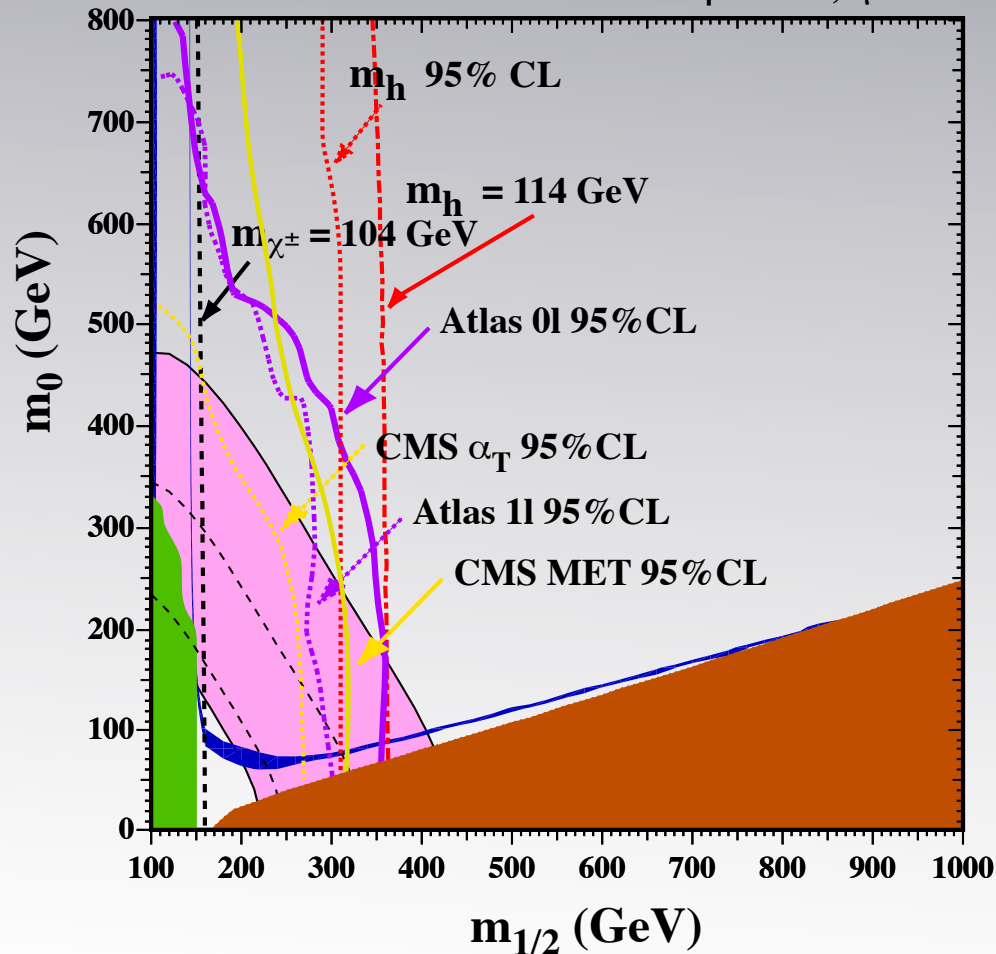
$m_0, m_{1/2}, A_0, \tan \beta$

Supergravity

in Phenomenology and Cosmology

CMSSM - supergravity inspired
 $m_0, m_{1/2}, A_0, \tan \beta$

$\tan \beta = 10, \mu > 0$

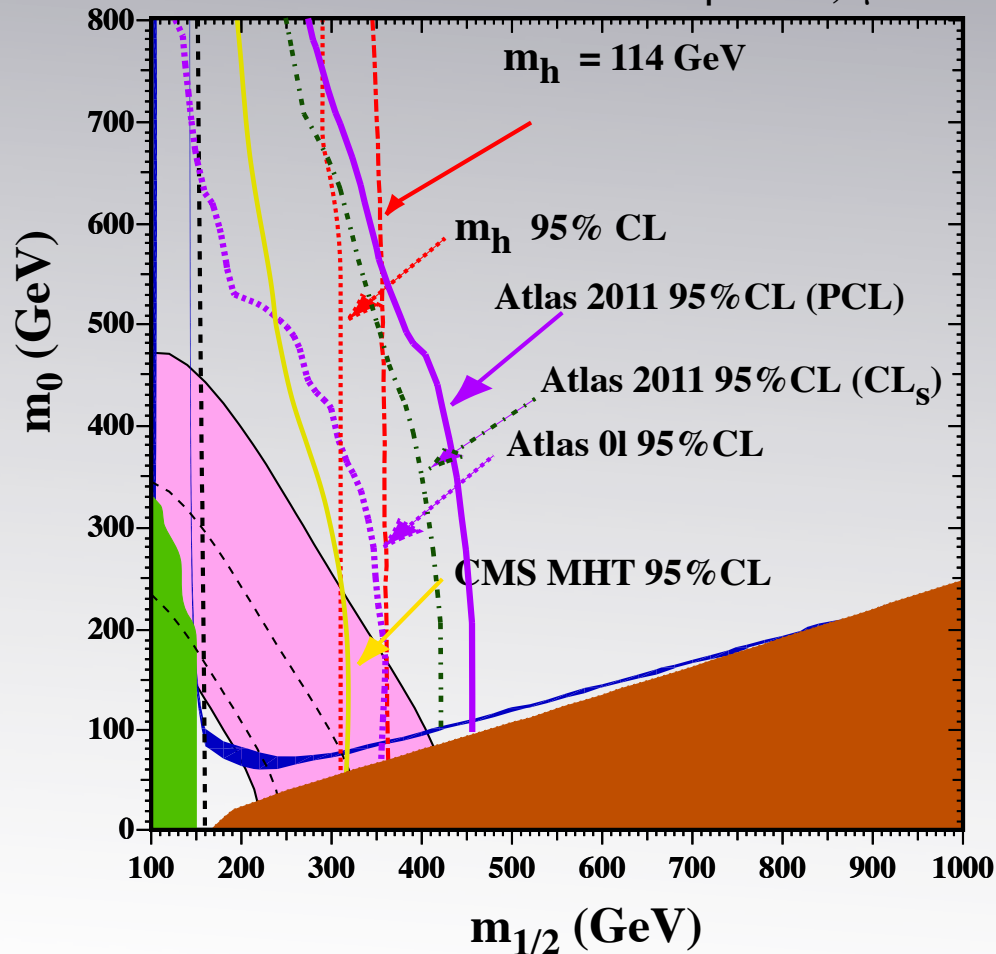


Supergravity

in Phenomenology and Cosmology

CMSSM - supergravity inspired
 $m_0, m_{1/2}, A_0, \tan \beta$

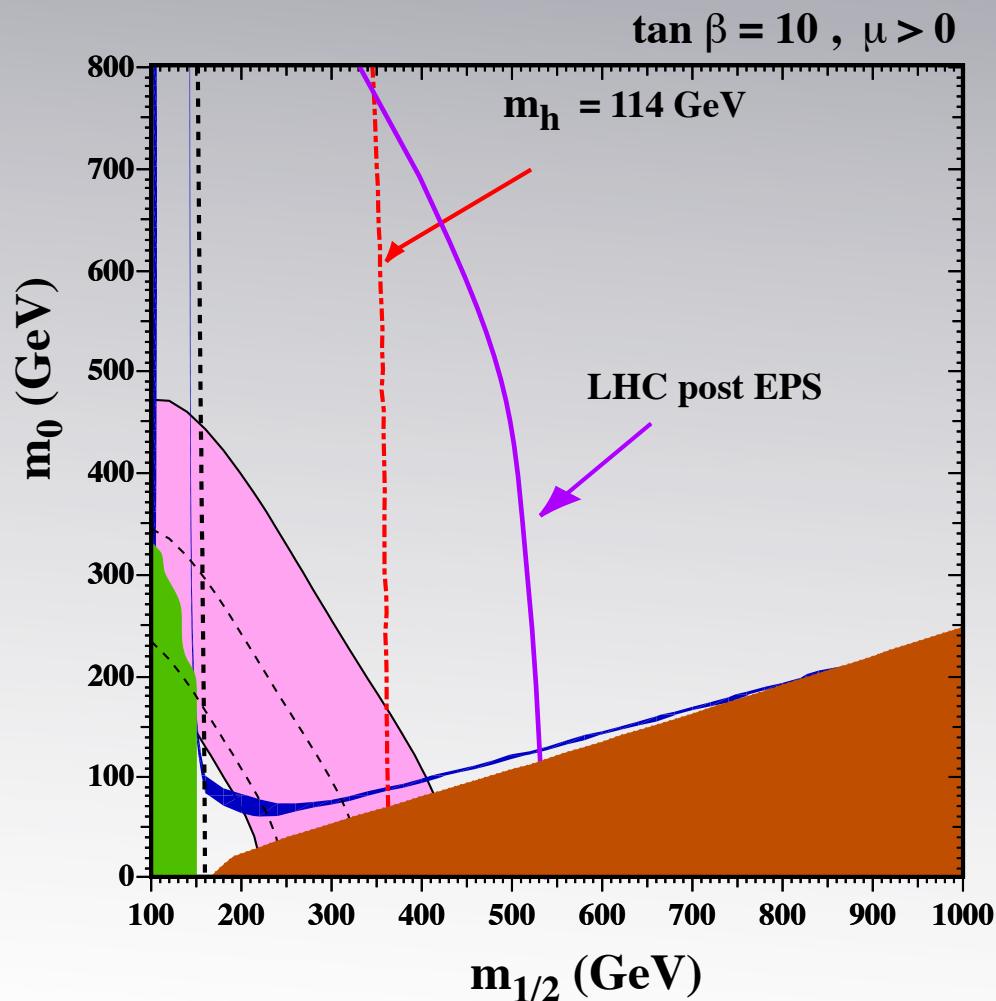
$\tan \beta = 10, \mu > 0$



Supergravity

in Phenomenology and Cosmology

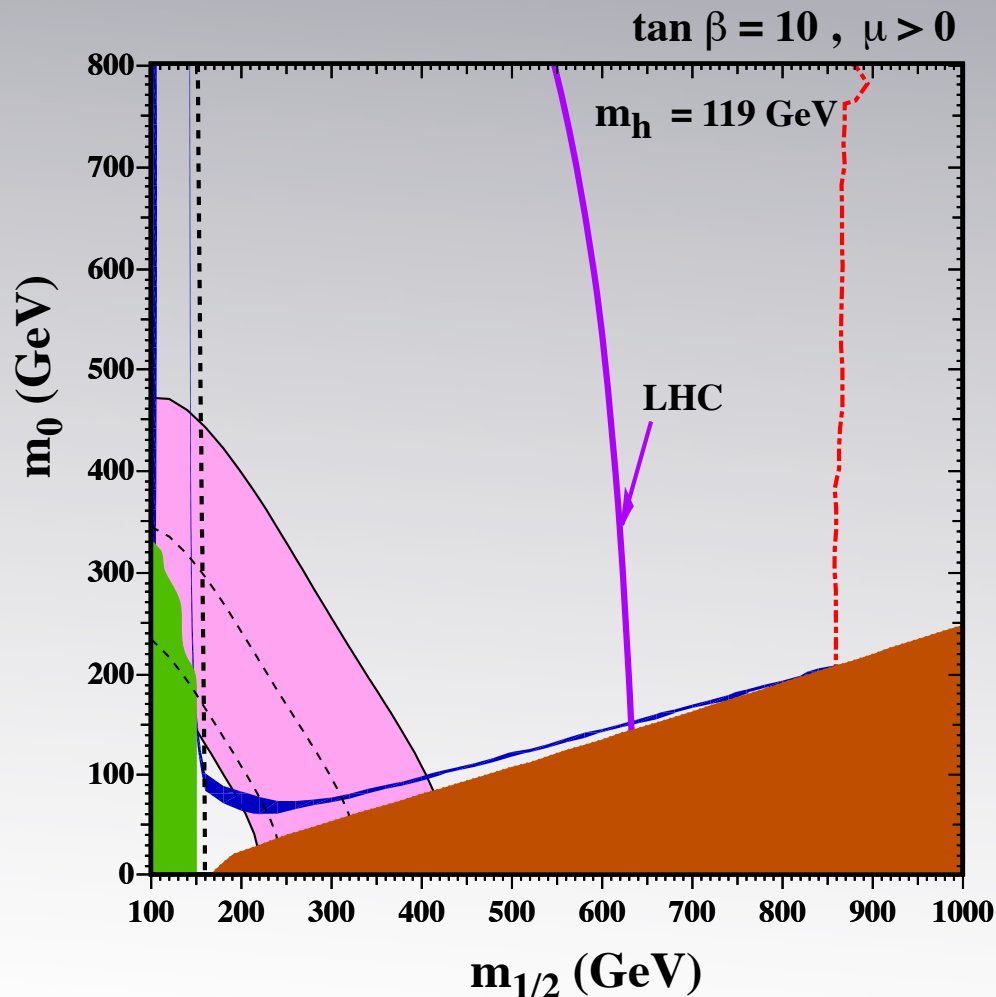
CMSSM - supergravity inspired
 $m_0, m_{1/2}, A_0, \tan \beta$



Supergravity

in Phenomenology and Cosmology

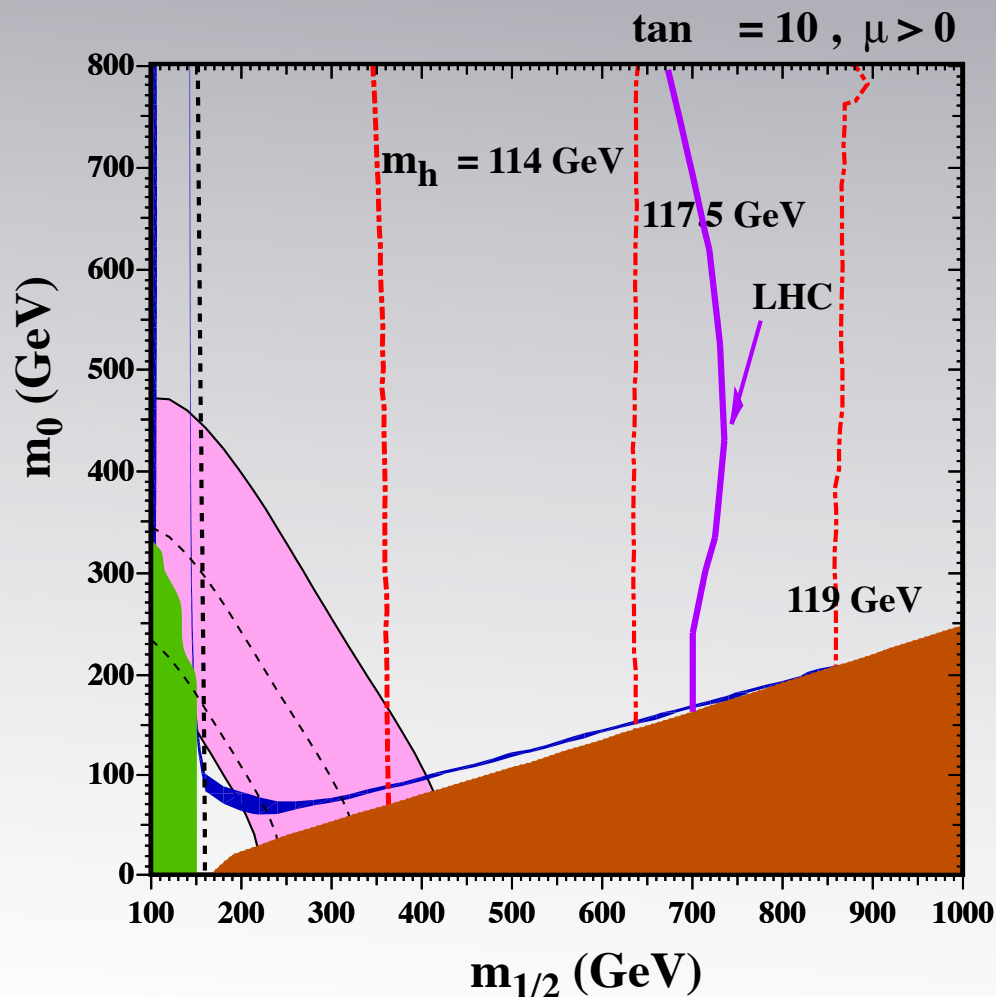
CMSSM - supergravity inspired
 $m_0, m_{1/2}, A_0, \tan \beta$



Supergravity

in Phenomenology and Cosmology

CMSSM - supergravity inspired
 $m_0, m_{1/2}, A_0, \tan \beta$

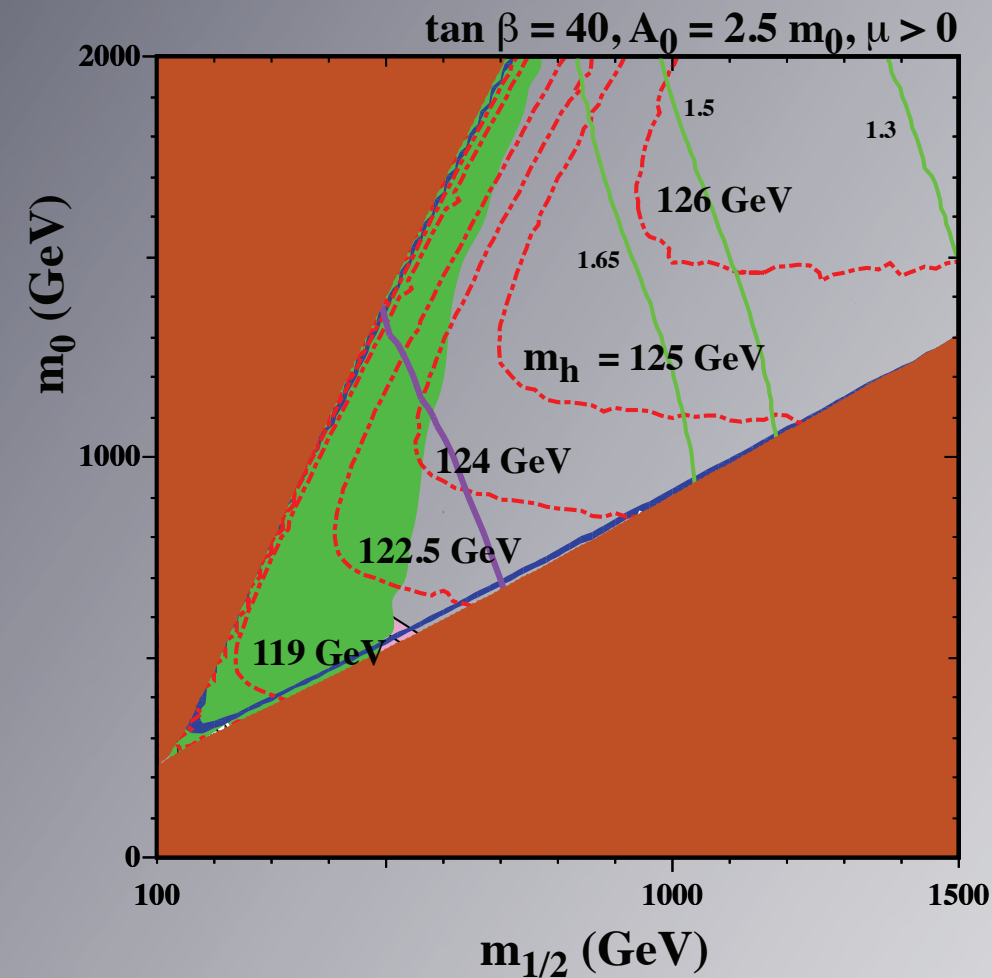


CMSSM - supergravity inspired
 $m_0, m_{1/2}, A_0, \tan \beta$

Figure 1 is a plot showing the Higgs boson mass m_h (in GeV) on the vertical axis (ranging from 0 to 800) versus the parameter $m_{1/2}$ (in GeV) on the horizontal axis (ranging from 100 to 1000). The plot displays various regions and boundaries:

- A green shaded region is located on the left side, corresponding to low $m_{1/2}$ values.
- A pink shaded region is located in the upper left, bounded by a solid black line.
- A blue line separates the pink region from a large orange region at the bottom.
- A purple line is labeled "LHC" and points to a specific curve.
- Red dashed lines indicate specific m_h values: $m_h = 114$ GeV, $m_h = 117.5$ GeV, and $m_h = 119$ GeV.
- A vertical black dashed line is positioned at $m_{1/2} \approx 150$ GeV.

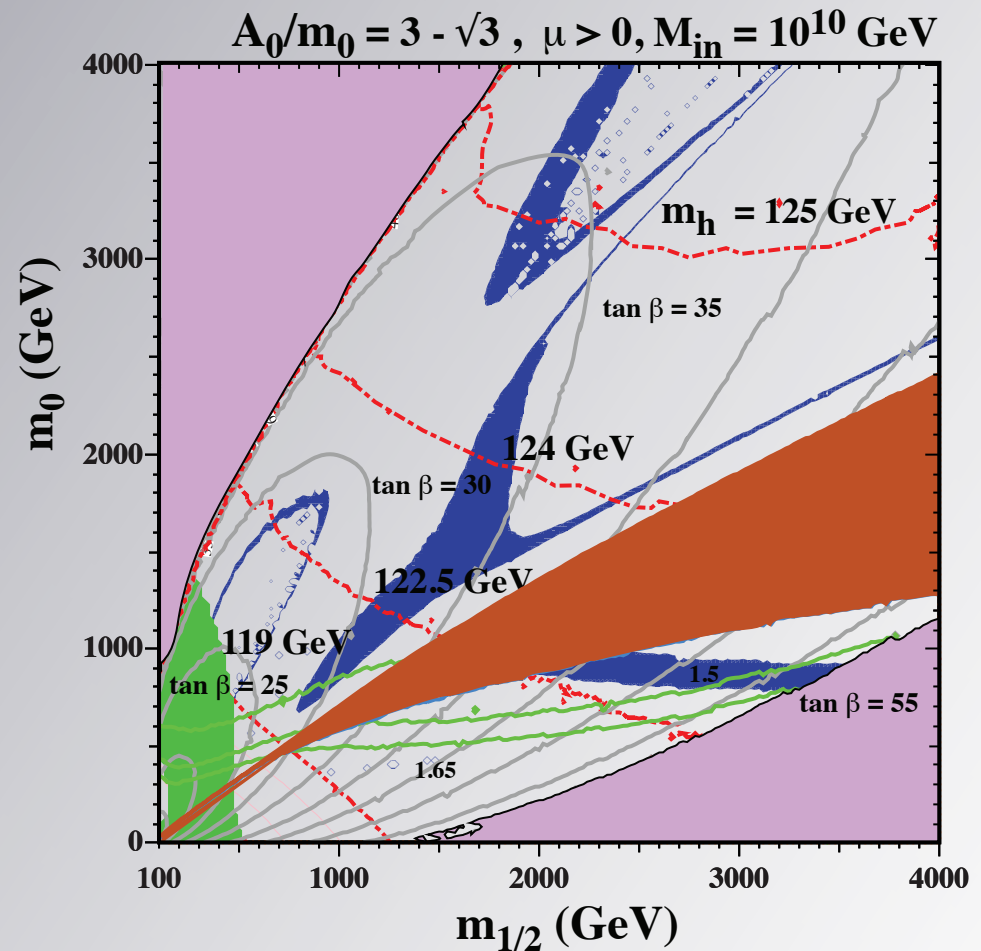




CMSSM with large A_0
to get $m_h \sim 125$ GeV

$B \rightarrow \mu^+ \mu^-$ becomes an
important constraint

3 parameter mSUGRA
 model: $m_{3/2}$, $m_{1/2}$, A_0
 ($\tan \beta$ - fixed by $B_0 = A_0 - m_0$)
 +
 SubGUT universality: M_{in}



Strong Moduli Stabilization/Pure Gravity Mediation

Heavy volume modulus ($m_T \sim M_P$) with heavy Polonyi-like field ($m_z \gg m_{3/2}$)

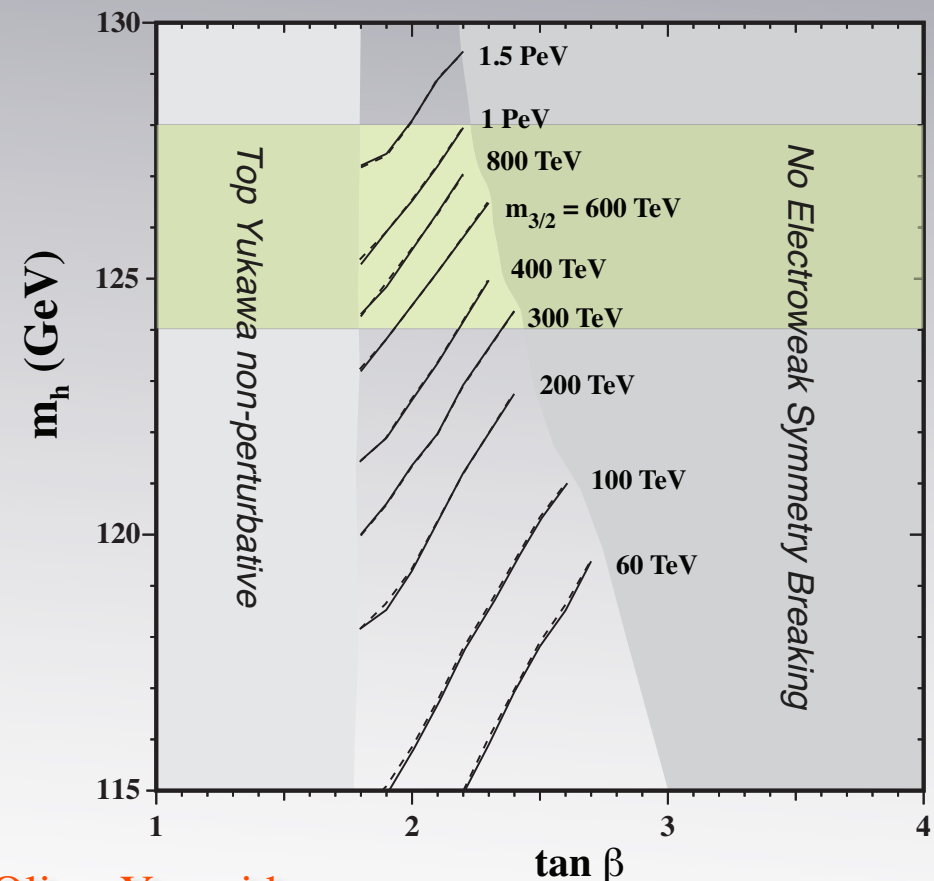
Dudas, Linde, Mambrini,
Mustafayev, Olive

- ✧ The sfermion, higgsinos, heavy Higgses and gravitino have masses $O(100)$ TeV.
- ✧ The gaugino masses are in the range of hundreds to thousands of GeV.
- ✧ The LSP is the neutral wino which is nearly degenerate with the charged wino.
- ✧ The lightest Higgs boson mass is consistent with the observed Higgs-like boson, i.e. $m_h \sim 125 - 126$ GeV.

Strong Moduli Stabilization/Pure Gravity Mediation

Two parameter model!

- ✧ $m_0 = m_{3/2}; \tan \beta$
- ✧ gaugino masses (and A-terms) generated through loops
- ✧ The sfermion, higgsinos, heavy Higgses and gravitino have masses $O(100)$ TeV.
- ✧ The gaugino masses are in the range of hundreds to thousands of GeV.
- ✧ The LSP is the neutral wino which is nearly degenerate with the charged wino.
- ✧ The lightest Higgs boson mass is consistent with the observed Higgs-like boson, i.e. $m_h \sim 125 - 126$ GeV.



Evans, Ibe, Olive, Yanagida

Inflation

- as the inflaton

T - as the inflaton

$$K = -3 \ln \left(T + T^* - \frac{\phi \phi^*}{3} \right)$$

$$W = M \left[\frac{\phi^2}{2} - \frac{\phi^3}{3\sqrt{3}} \right]$$

Ellis, Nanopoulos,
Olive

$$W = \sqrt{3} M \phi (T - 1/2)$$

Cecotti; Kallosh,
Linde

Equivalent to $R + R^2$ (Starobinsky) model of gravity

